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RDS-6
RDS-6t
RDS-6s / product 501-6

In 1945, I.V. Kurchatov received information through intelligence channels about research on the thermonuclear problem being conducted in the USA, which was started in 1942 on the initiative of Edward Teller. His ideas were discussed with the leading participants of the Manhattan Project and came together to form a coherent concept by the end of 1945. According to this concept, the hydrogen bomb was called the "Classical Super" (or simply Super). On the instructions of I. V. Kurchatov, in December 1945, a group of Soviet physicists led by Yu. B. Khariton performed a preliminary analysis of the possibilities of creating a thermonuclear weapon. On December 17, 1945, Ya. B. Zeldovich reported on the results of this work to the technical council under the Special Committee. Then a group from the Institute of Chemical Physics of the USSR Academy of Sciences (Ya. B. Zeldovich, A. S. Kompaneets and S. P. Dyakov) began studying one of the possible options for the development of a thermonuclear reaction. This option (RDS-6t, "pipe") was chosen based on intelligence data. The incoming information about the "superbomb" could not help but cause serious concern among the USSR leadership (*source: Veselovsky*).

Based on the examination of B. L. Vannikov, I. V. Kurchatov and Yu. B. Khariton, I. V. Stalin approved on June 10, 1948 measures designed to provide a conclusion within a year on the feasibility of creating a hydrogen bomb. At the Plekhanov Physical Institute, P.N. Lebedev of the USSR Academy of Sciences created a group of theorists under the leadership of I.E. Tamm, which included A.D. Sakharov, V.L. Ginzburg, Yu.A. Romanov, S.Z. Belenkiy and E.S. Fradkin (*history - Veselovsky*). In the autumn of 1948, A.D. Sakharov, independently of Edward Teller, came up with the idea of a heterogeneous scheme with alternating layers of deuterium and U-238 ("layer cake"). The principle of ionization compression of thermonuclear fuel underlying it is called "saccharification" ("first idea"). At the end of 1948, V.L. Ginzburg proposed using lithium 6 deuteride as thermonuclear fuel ("second idea"). On the instructions of B.L. Vannikov, on May 8, 1949, Yu.B. Khariton prepared a conclusion, noting that the main idea of A.D. Sakharov's proposal was "extremely witty and physically clear" and supported the work on the "layer cake" (*source - Andriyushin I.A., Ilkaev R.I....*).

On the same day, the USSR Council of Ministers Resolution No. 828-304 "On the organization of tritium production" was issued. Soon, the USSR Council of Ministers Resolutions on the organization of lithium-6 deuteride production and the construction of a specialized reactor for tritium production were adopted (source - Andryushin I.A., Ilkaev R.I., ...).

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Bomb 501-6 with RDS-6s charge in the RFNC-VNIIEF Museum, Sarov (<http://wsyachina.narod.ru/>).

Development of technologies and construction of production facilities began. Unlike the Americans, Soviet scientists and designers solved all three main problems at once when creating the first hydrogen charge (RDS-bs):

- checking the operability of the physical circuit of the charge
- creating a sample in a design that is fully compatible with delivery vehicles - an aviation bomb in the case of "article 501-6" and, in the future, in the warhead of the R-7 intercontinental missile
- a test sample of the charge was manufactured taking into account its subsequent serial production

All elements of the charge were developed by April 1953. A report with the calculation and theoretical justification of the operation of the RDS-6s product was released on July 15, 1953. The report was signed by I.E. Tamm, Ya.B. Zeldovich, A.D. Sakharov. The report is entitled "Model of the RDS-6 s Product", although the text refers to the full-fledged RDS-6s product and the tested model "is no different from the combat product", except for the greater mass of active materials in the combat product. The authors of the development clearly indicated that "the RDS-6s product is a hydrogen atomic bomb". The authors estimated the calculated power of the product at 300+100 kt of TNT equivalent (source - *Andryushin I.A., Ilkaev R.I....*).

The tests were supervised by I.V. Kurchatov, Academician I.V. Kurchatov, Minister of Medium Machine Building V.A. Malyshev, Deputy Minister of Defense of the USSR Marshal of the Soviet Union A.M. Vasilevsky, Deputy Minister of MSM A.P. Zavenyagin, Director of the IPM Academician M.V. Keldysh, Academician N.N. Bogolyubov, Academician M.A. Lavrentyev, Director of the Institute of Chemical Physics of the Russian Academy of Sciences Academician N.N. Semenov, Corresponding Member of the Russian Academy of Sciences I.E. Tamm, B.S. Dzelepev, V.P. Dzelepev, A.D. Sakharov, Corresponding Member of the Russian Academy of Sciences Ya.B. Zeldovich, Head of the 6th Civil Defense Department of the Ministry of Defense V.A. Bolyatko, Test Site Commander A.V. Yenko, B.M. Malyutov, Deputy Minister of Health A.I. Burnazyan, S.L. Davydov, Head of the 5th State Institution V.I. Alferov; Chief Designer, Scientific Director, Corresponding Member of the Academy of Sciences Yu.B. Khariton. Three weeks before the tests, a young employee of KB-11 V.Yu. Gavrilov drew attention to the fact that as a result of the ground explosion of RDS-6s, significant territories where civilians live would be contaminated due to radioactive fallout. At the state level, measures were taken to urgently resettle 12,794 people and 393,040 heads of cattle were removed (source - *Andryushin I.A., Ilkaev R.I....*).

The first test of the RDS-6s charge was conducted at the P-1 experimental field of the Semipalatinsk test site on August 12, 1953. The charge was located at a height of 30 m in a 40-meter tower. The explosion formed a fiery sphere with a diameter of about a kilometer, a five-story panel house at a distance of 3 km was blown away by a shock wave, a mushroom cloud rose to a height of 16 kilometers, the transverse size of its cap was also 16 kilometers. The energy release exceeded the calculated one and amounted to about 400 kilotons. Within a radius of 600 meters, the earth melted and turned into glass-like slag. T-34 tanks, located at a distance of 1 km, were thrown back 20 meters.

Following the results of the tests, Yu. Khariton ordered not to give statements to the media about the creation of a water bomb, but to give information about the tests of a powerful atomic bomb with thermonuclear enhancement in the USSR. The reason is that the United States could have obtained atmospheric analysis data that would have allowed the Soviet water bomb to be compared with the American one, and such a comparison would not have been in favor of the Soviet bomb. On

December 15, 1953, at a meeting with the chief designer, it was decided to continue work on increasing the power of RDS-6s type products.

In 1954, it became clear that the creation of the RDS-6s charge did not completely solve the problem of creating a thermonuclear bomb with a power of several megatons. From the second half of 1954, work on a new scheme of a two-stage thermonuclear charge (RDS-37) became a priority.

Tests of the body of an aviation bomb (product 501-6) for the RDS-6s charge were completed in the first half of 1954, and if the products were stored, then in the body of an aviation bomb (this happened between February and June 1954). Bomb 501-6 with RDS-6s charge was produced in small series at the first serial plant No. 551 KB-11 (*history - Atomic era*). There is no data on the acceptance of the bomb into service.

On August 25, 1953, the Minister of Medium Machine Building V.A. Malyshev was sent lists of KB-11 employees nominated for awards in connection with the creation of RDS-6s. A total of 753 people.

The title of Hero of Socialist Labor was awarded to 10 employees of KB-11:

- Bobolev Vasily Konstantinovich
- Grechishnikov Vladimir Fedorovich
- Davidenko Viktor Aleksandrovich
- Dukhov Nikolay Leonidovich
- Zababakhin Evgeny Ivanovich
- Zeldovich Yakov Borisovich
- Sakharov Andrei Dmitrievich
- Tamm Igor Evgenievich
- Khariton Yuliy Borisovich
- Shchelkin Kirill Ivanovich

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Nineteen people were nominated for the Order of Lenin, 127 people for the Order of the Red Banner of Labor, six people for the Order of the Red Star, 104 people for the Order of the Badge of Honor, 323 people for the Medal for Labor Valor, and 177 people for the Medal for Labor Distinction. The employees of KB-11 received these awards in accordance with the Decrees of the Presidium of the Supreme Soviet of the USSR of August 21, December 24 and 31, 1953, and January 4, 1954. A total of 100 people were nominated for the Stalin Prize of three degrees for KB-11. By the Decree of the Presidium of the Supreme Soviet of the USSR of January 4, 1954, the KB-11 team was awarded the Order of Lenin. (*source: I.A. Andryushin, R.I. Ilkaev...*).

The design is made in the body of the aviation bomb "product 501-6" (*ist - Atomic era*). The bomb body was tested in the first half of 1954 and did not participate in the tests of 12.08.1953. The PG-4083 parachute was developed specifically for the bomb with the RDS-6s charge by the Scientific Research Institute of Parachute-Landing Equipment.



Bomb 501-6 with RDS-6s charge in the RFNC-VNIIEF Museum, Sarov (<http://vpk-news.ru/>).

Bomb performance characteristics :

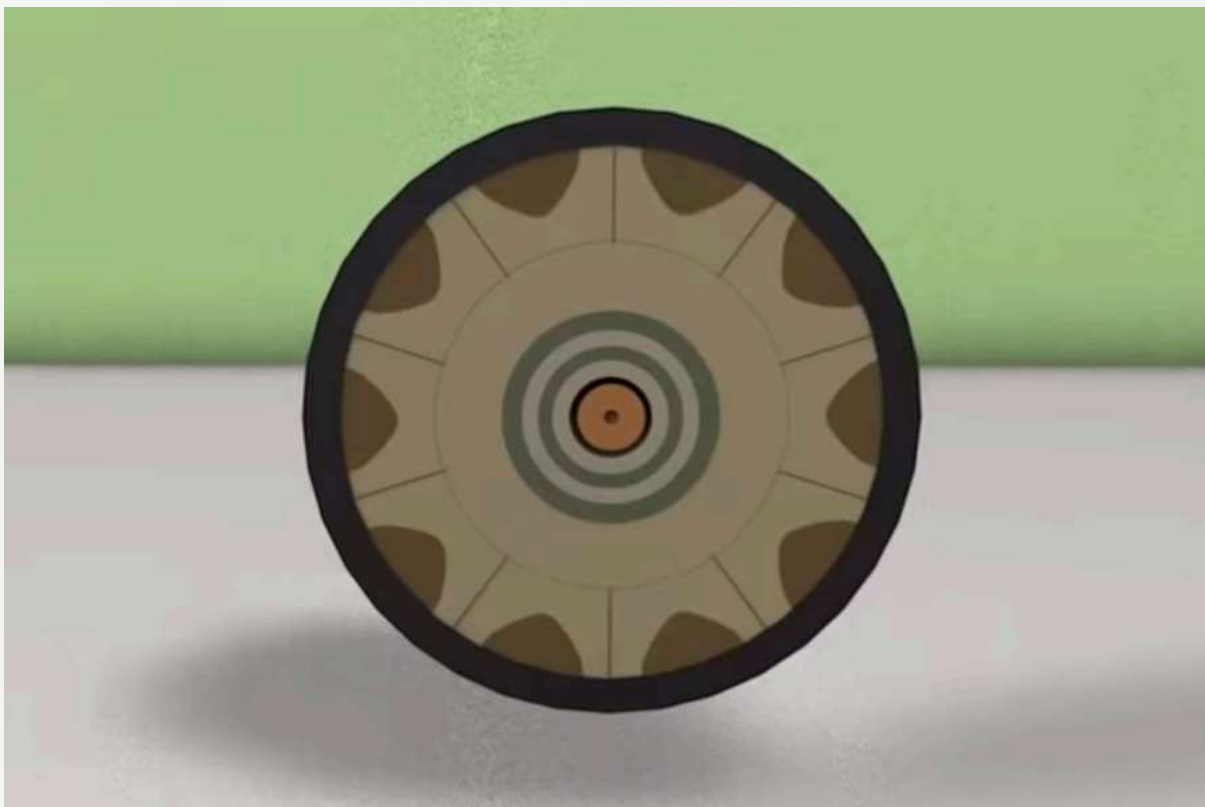
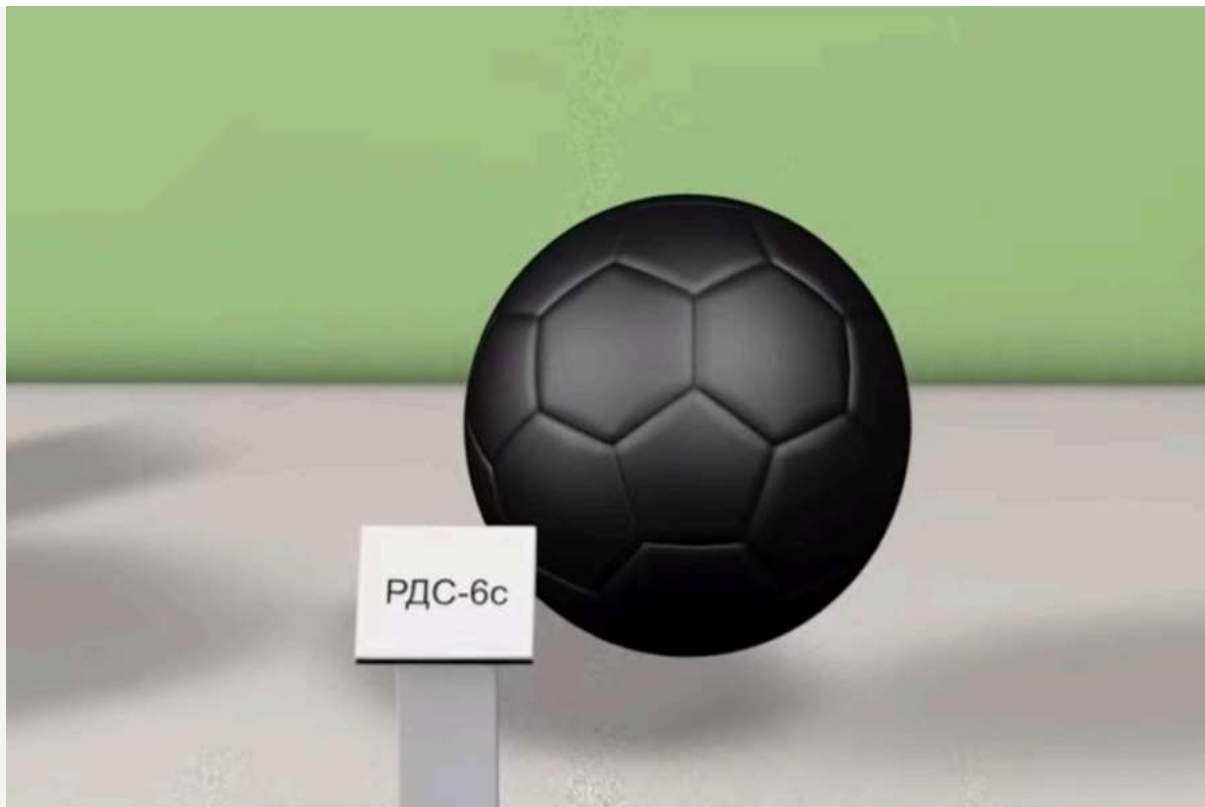
Explosive power:

- estimated - 400 kt
- estimated warhead - 1 Mt
- real - 400 kt \pm 50 kt (12.08.1953)

Charge type : thermonuclear, single-stage, "layer cake" type. In the bomb model that was tested on 12.08.1953, a smaller amount of tritium and uranium-235 was used.

The working substance of the "layer cake" is deuterium / lithium-6 deuteride (*source - Goncharov G.A. ...*, which forms tritium upon neutron capture) and uranium-235 (U-235)

Weight of U-235 - estimated 55 kg (warhead version of the RDS-6s charge)



Schematic diagram of the RDS-6s nuclear charge ([source](#)).

Modifications :

RLS-6t - a project for a "pipe" type thermonuclear device. The project was developed by Ya.B. Zeldovich's group. The project was not implemented ([source](#) - *Andryushin...*). In February 1954, at a meeting with the Minister of Medium Machine Building V.A. Malyshev, a decision was made to cease work on deuterium detonation at the Arzamas-16 facility, i.e. on the RDS-6t charge.

RLS-6s - a project for a "layered" design thermonuclear device. The project was developed by A.D. Sakharov's group. The project was implemented and served as the basis for starting work on the RDS-37 two-stage thermonuclear charge.

RDS-6sd - a modified version of the RDS-6s - a "layered" charge type. Work on the charge was continued in 1954-1955. in RDS-27 and RDS-37 charges. On January 20, 1955, Minister of Medium Machine Building V.A. Malyshev sent a plan for experimental design work to KB-11, which provided for:

7. Development of the RDS-6sd hydrogen bomb with a capacity of 1.7-2.0 million tons of TNT equivalent;
8. Development of a warhead with an RDS-6sd atomic charge for the R-7 missile;
9. Development of a warhead with an RDS-6sd atomic charge for the K-20 flying projectile;
- ...
13. Development of a warhead with an RDS-6sd atomic charge for the Buran cruise missile;

RDS-2Z - further development of the "sloika" scheme, a bomb with a charge tested at the Semipalatinsk test site on November 6, 1955. After the successful test of the two-stage RDS-37 charge on November 22, 1955, work on charges made according to the "sloika" scheme was discontinued.

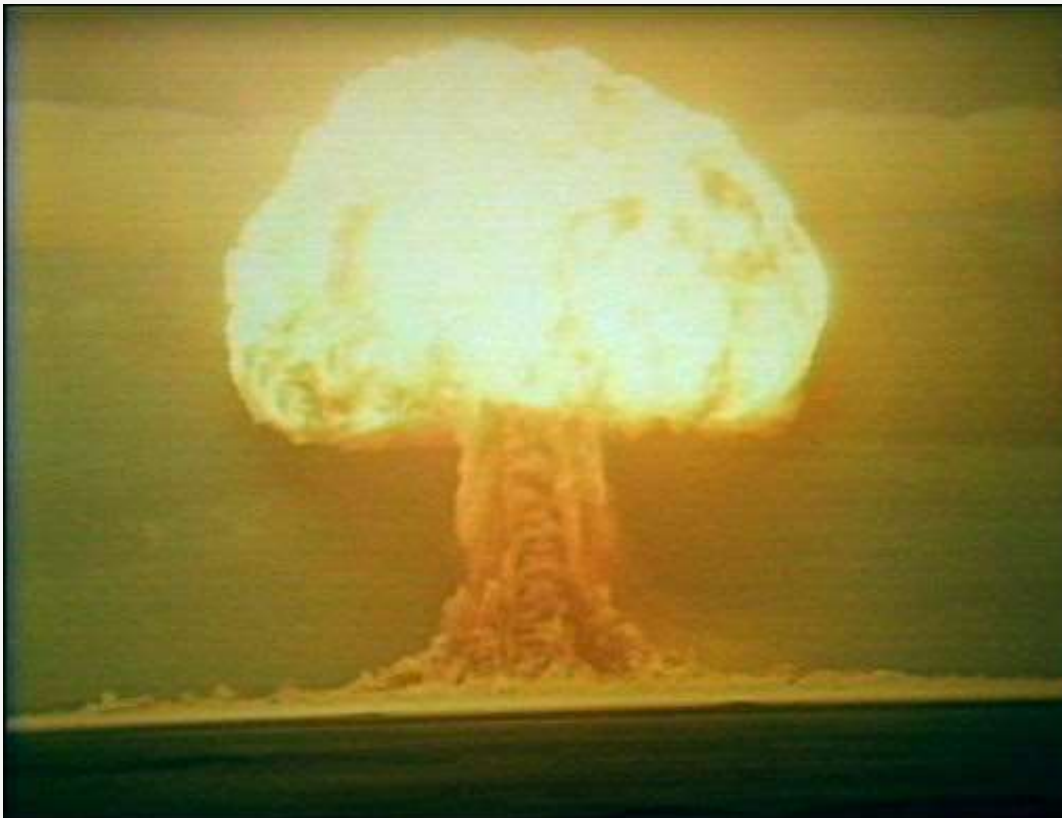
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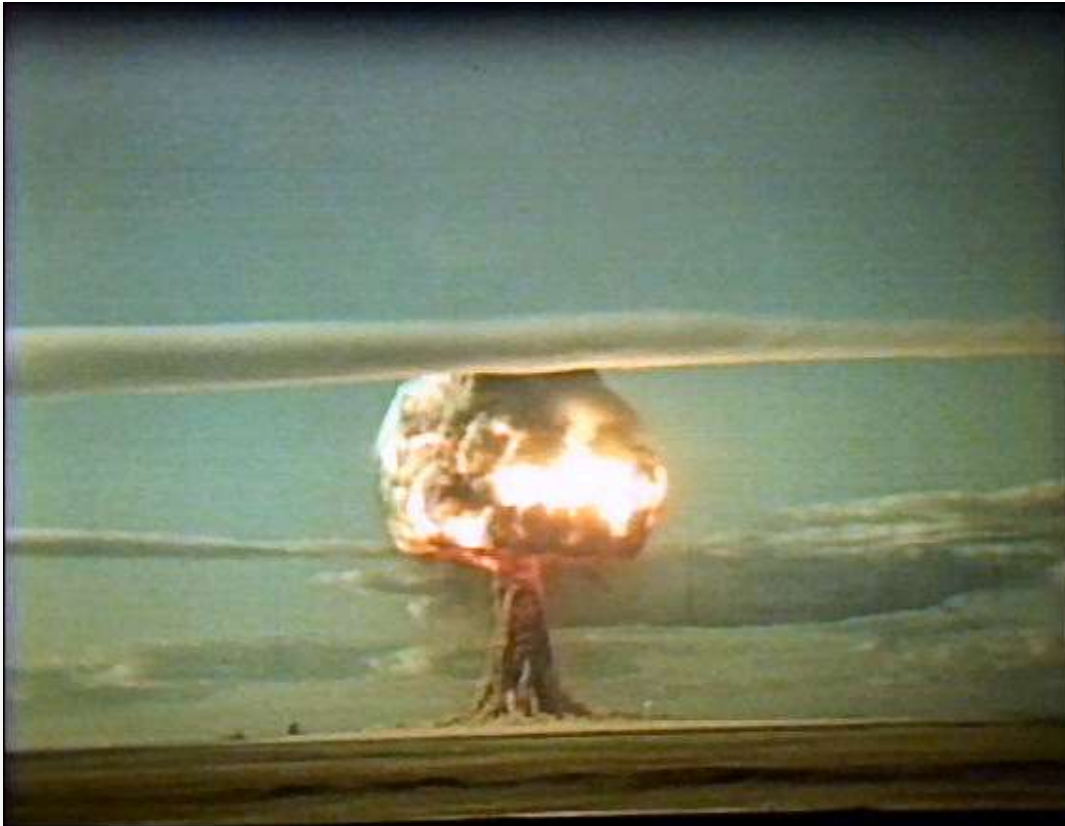
- 1953 August 6 - Chairman of the Council of Ministers of the USSR G.M. Malenkov spoke at a session of the Supreme Soviet of the USSR. In his report on the current situation, he said, in particular: "The American imperialists are scaring us with a superweapon - the hydrogen bomb. But we should not be scared, we not only know the secret of the hydrogen bomb, but also created it."

- August 12, 1953 - the first test of the RDS-6s charge at the Semipalatinsk test site. Head of the test site - K.I. Shcheokin, scientific director - I.V. Kurchatov. After the thermonuclear explosion in August 1953, a large crater was formed and severe radioactive contamination of the territory of the P-1 site arose, which excluded the possibility of further use of most of the instrument structures built on it (*source - Volume II*).



General view of the central part of the experimental field before testing the first RDS-6s thermonuclear charge. Semipalatinsk test site (photo - Minatom archive, <http://wsyachina.narod.ru/>).





Explosion of the RDS-6s device at the Semipalatinsk test site. Different moments of the explosion. 12.08.1953 (photo - Minatom archive, <http://wsyachina.narod.ru/>).

- 1956 - due to the aggravation of the international situation, two special teams were created from the employees of KB-11 and NII-1011, which assembled two RDS-6s bombs for possible use in the event of a crisis. These teams served as a prototype for future military assembly teams at the USSR Design Bureau of the Nuclear Forces ([source](#)).


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